1. Switch Functionality And Cost

Q. Should a forward-looking cost model design a switched network capable of handling all traffic demands?

A. Absolutely. Accepted engineering practices, proper design parameters, necessary switch functionality, and appropriate quality standards require that a forward-looking cost model design a network that can handle all traffic demands, including peak period traffic. The Commission confirmed the importance of this approach in the Tenth Report and Order, stating that, in order to appropriately estimate forward-looking costs, a model must "ensure that adequate capacity exists in that switching facility to process all customers' calls that are expected to be made at peak periods."[41]

Q. Can the switches designed by the Modified Synthesis Model provision the UNEs required by the Commission?

A. No. The Modified Synthesis Model's data inputs, some dating back to 1983, involve switches that are not capable of provisioning the technology for which the Modified Synthesis Model is developing UNE costs. A study by the National Regulatory Research Institute ("NRRI") states:

> "During the years covered by this data set the overwhelming majority of the lines were for voice service. Therefore, to a large extent, the per-line investment estimates do not reflect the

[41] Tenth Report and Order at ¶ 12.

> additional costs associated with providing ISDN lines on a digital switching machine."[42]

While this might have been appropriate for a USF proceeding, this proceeding requires inclusion of these additional ISDN costs, as well as the ability to discretely identify them, which the Modified Synthesis Model cannot do. The NRRI study also states, "Subsequent to the initial installation, equipment may have been modified to provide new services or functions. For example, in the late 1980s and early 1990s, the hardware of both the Nortel and Lucent family of switches was modified due to the technical requirements of the Signaling System Seven ("SS7") and the Custom Local Area Signaling Services ("CLASS")."[43] By failing to account for the full range of technologies (both hardware and software related) currently being deployed, the Modified Synthesis Model cannot develop a switching cost that properly compensates Verizon VA or any efficient carrier for all of the switch functions required in a forward-looking network or for the services it provides to CLECs.

Q. Did the Commission address the Synthesis Model's switching and IOF module for UNE applications?

A. Yes. In its USF Order, the Commission adopted the HAI Model's switch and IOF module, with modifications, and noted that "...for universal service purposes, where cost differences caused by differing loop lengths are the most significant

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[42] David Gabel, Scott Kennedy, "Estimating the Cost of Switching and Cables Based on Publicly Available Data," National Regulatory Research Institute (NRRI) (April 1998) at p. 114.

[43] *Id.* at pgs. 120-121.

cost factor, switching costs are less significant than they would be in, for example, a cost model to determine unbundled network element switching and transport costs."[44] Accordingly, the Synthesis Model's, and by implication the Modified Synthesis Model's, treatment of the costs associated with the switching and IOF module, as well as its input values, are less exacting and thus are less representative of a carrier's switching and IOF costs.

Q. Can the Modified Synthesis Model accurately estimate state-specific or company-specific switch costs?

A. No. The Modified Synthesis Model cannot accurately estimate state-specific or company-specific switch costs. The Model uses the following flawed methodology for developing a switch usage UNE:

1. The Modified Synthesis Model calculates the average total switching cost per-month. The Model uses a regression of the rural utilities service ("RUS") data and the Commission depreciation data to estimate switch investment. The cost is determined by taking into account only two factors: the office line size and the type of office (remote or host). As a result, the total switching monthly costs generally reflect only the average usage for the switches contained in the sample.[45]

2. The average total monthly cost is then split: 30 percent for port and 70 percent (model default values) for usage.

3. The total usage cost is divided by some company-specific usage values, as if the usage amount were actually calculated based on the particular state-specific company usage and cost characteristics, which it is not.

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[44] Fifth Report and Order at ¶ 75.

[45] In those cases where the initial investment based on line demand does not pass the busy hour capacity tests, then additional switching investment will be generated by the Modified Synthesis Model based on the forecasted year 2002 ARMIS usage data.

Because the total usage cost is simply a reflection of a dated average, the resulting values have no real meaning and do not reflect state-specific or company-specific inputs.

2. Switch Engineering

Q. Does the Modified Synthesis Model adhere to standard switch engineering principles?

A. No. The Modified Synthesis Model produces a network on which customers would frequently be denied service. Specifically, the Modified Synthesis Model fails to recognize that each central office and its associated trunking network experience an annual busy season, which is characterized by periods of high or peak traffic loads.[46] Instead, the Modified Synthesis Model assumes that a fixed amount of traffic is spread equally over 270 business days and 10 percent of the average business day traffic occurs during the busy hour. As a result, the Modified Synthesis Model's network is only equipped to handle the same busy calls every day.

Mr. Turner suggests that busy hour traffic loads are accounted for in the Model since Dial Equipment Minutes ("DEMs") are divided by 270 days instead of 365 days to compensate for weekend traffic that is historically lower than business day traffic, and the busy hour load is 10 percent of the average daily

[46] Even though the wording might suggest a single busy period, actually, various parts of the switch and various trunk groups experience different busy hours during the day in which they reach peak (designed/engineered for) traffic loads.

load.[47] However, even after adjusting for lower weekend traffic,[48] Mr. Turner offers no quantitative support to show that the Model, with its simplistic determination of the busy hour, is capable of accommodating the higher traffic loads experienced during the busy season's peak traffic periods.

Q. Why do central offices experience different traffic loads during the year?

A. Most, if not all, central offices experience different traffic loads during the year for a variety of reasons. Central offices serving a college town or resort community are good examples of why some periods of the year are considerably busier than others. In September, an influx of college students into a community substantially increases a central office's traffic load. Similarly, resort communities experience peak traffic during a much shorter 2 or 3-month vacation period. Therefore, an exchange in such a community might experience upwards of 60-75 percent of its total annual traffic during a 2 or 3-month peak busy period. The switched network modeled by the Modified Synthesis Model, which is engineered to accommodate an inadequate average daily load, as opposed to higher seasonal or peak-loads, would not be equipped to handle the amount of traffic carried over the network during these peak periods.

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[47] Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *Direct Testimony of Steven E. Turner* (July 31, 2001) at p. 6.

[48] Mr. Turner offers no explanation to explain the derivation of the 270 days he supports. Additionally, the fact that the Modified Synthesis Model must rely on this approach to approximate business day traffic reveals another Model shortcoming. More appropriately, an engineer would remove weekend and holiday traffic, before determining a representative business day value for the approximately 251 business days of the year.

Q. Do engineers take specific traffic patterns into account when sizing the components of a central office switch and trunking network?

A. Yes. In the real world, the switching and trunking networks that serve each and every wire center, including college and resort communities, are engineered to handle higher seasonal and busy hour call volumes. For example, in a resort community, engineers would size the central office to ensure it could handle the very high calling demands of the busy hour(s) during the peak busy season period.[49] Even within the switch, various components (e.g., lines and trunks) are engineered to different standards and sometimes different busy hours, reflecting their own specific traffic demands (load).

3. Switch Traffic Sensitive And Non-Traffic Sensitive Apportionment

Q. Is switch investment apportioned between traffic sensitive and non-traffic sensitive elements?

A. Yes. A switch is comprised of traffic sensitive and non-traffic sensitive equipment. In order to distinguish traffic sensitive equipment from non-traffic sensitive equipment, one must understand how a switch operates. In those instances when a switch is not processing calls, the switch monitors subscriber lines for dial tone requests. Until a subscriber picks up the handset or a call

[49] "Although traffic theory is useful in predicting the performance of a given load submitted to a given number of servers, considerable engineering judgment is required to select the particular load levels (engineering periods) about which to be concerned. One consideration is the type of equipment being engineered. For trunk groups (Circuits between switching systems) the average of the twenty BDBH measurements is used, giving rise to the concept of the *average busy season busy hour* (ABSBH)." Technical Staff and Technical Publication Department of AT&T Bell Laboratories, *Engineering and Operations in the Bell System* (2d Ed. 1983) at p. 153.

comes in on the trunk side, most of the switch investment is not utilized. However, upon receiving a call request, the switch performs a multitude of tasks to determine the eligibility of the calling line for services, route the call, bill the call, and deliver services during the duration of the call. It is, therefore, appropriate to categorize a significant portion of the switch as traffic sensitive.

Q. What switch components are non-traffic sensitive?

A. The initial equipment stage of the line termination is the only portion of the switch that is non traffic sensitive -- it is dedicated to a single subscriber and is never used for any purpose other than establishing a communications path with that one subscriber. However, additional line termination equipment (such as that comprised of analog line units in the 5ESS and line concentrator modules (LCMs) in the DMS-100) is traffic sensitive -- with the amount of required equipment determined based on the engineered usage (busy hour CCS) of the lines. The initial equipment stage of the line termination typically consists of a wire terminal appearance on the main distribution frame, a shelf, and associated wiring that accepts a line card, as well as the plug-in line card itself.

Q. Is Ms. Pitts' recommendation to change the Modified Synthesis Model's default value for the traffic sensitive part of the switch appropriate?

A. Absolutely not. Ms. Pitts states that the traffic sensitive portion of the switch, which is used to determine the usage cost of a switched UNE, should be changed from the Synthesis Model's default value of 70 percent to 40 percent. Her

recommendation, however, is unfounded and results in significantly understated usage costs (and overstated non-traffic sensitive costs). Ms. Pitts claims that switch memory and processors should be allocated as non-traffic sensitive costs that do not vary with respect to usage or features.[50] Ms. Pitts assumes cost causation dictates that variable costs should be assigned to usage, and fixed costs assigned to ports. But that notion is incorrect. Assigning costs between non-traffic sensitive (port) and traffic sensitive (usage) is determined by taking into account switch resources dedicated to a single user, and resources shared among all users. Dedicated resources should be recovered by the particular user dedicated to that resource (such as a port). Shared resources should be recovered by each user sharing those resources in a fair cost causation manner (such as a per minute of use charge.) Switch features such as local number portability, call waiting, and caller ID have an impact on call processing time, and are shared between users, and thus are clearly traffic sensitive. In addition, other parts of the switch involved in setting up, connecting, and billing the call, such as the switching matrix, the initial equipment stages of analog line termination connection, trunks, signaling processor, and automatic message accounting functions, are shared among users and are sensitive to the traffic generated by those users. Even engineered port capacity can exhibit usage sensitive features since the maximum fill might have to be reduced to accommodate heavy usage (i.e., Internet) impacting the concentration ratio of the first stage switch matrix. Ms. Pitts ignores all of these switching functions and components in making her

[50] Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *Direct Testimony of Catherine E. Pitts* (July 31, 2001) at p. 7.

proposal to significantly alter the portion of the switch that is traffic sensitive. Her flawed estimates are unsupported and have no justification in theory or practice.

Second, Ms. Pitts also bases her proposed reduction on a badly flawed cost causation argument. Mistakenly, she suggests that a switch's exhaustion is solely a function of its port capacity, and therefore, much of the fixed cost of the switch should be assigned to the port.[51] To the contrary, exhaustion of port capacity is only one factor that contributes to exhaustion of the entire switch. Ms. Pitts claims that port exhaustion in the Modified Synthesis Model drives the placement of a second switch, and therefore the fixed cost of the second switch should be assigned to the non-traffic sensitive port cost. This assumption is absurd. The Modified Synthesis Model places a second switch after performing several capacity checks, including a check of the processor's real time usage. Failure of this real-time usage check will produce a second switch. Ms. Pitts, however, ignores this fact, which is referenced in the Modified Synthesis Model's own documentation, when arguing for her proposed reduction.[52]

[51] Ms. Pitts also fails to recognize that switch port limitations are a combination of line ports, which are partially traffic sensitive, and trunk ports, which are entirely traffic sensitive. Thus, the more traffic demand placed on the switch, the more trunk ports that are required, and the lower the quantity of lines that can be engineered to operate on the analog line module components of the switch. In addition, as traffic demand increases from a static number of lines, the line-to-trunk ratio decreases because more trunks must be added. This requires a greater amount of switch matrix capacity to handle a fixed quantity of lines. Thus, high volumes of usage (traffic) can and often are the main cause of total switch exhaustion.

[52] HAI Model Release 5.0a, Model Description at p. 56.

Even Mr. Pitkin seems to have recognized the infirmities in Ms. Pitts' arguments, ignoring her recommendation in favor of using the Model's default "End Office Traffic Sensitive Fraction." The very fact that Ms. Pitts recommended the value in the first place highlights her flawed reasoning and lack of thorough analysis, thereby signaling to the Commission that it should proceed with caution with respect to her proposed recommendations. In addition, Mr. Pitkin's track record of declining, initially, to adopt various recommended inputs, and then, at the eleventh hour, incorporating some of them into the Modified Synthesis Model,[53] should alert the Commission to be prepared, if necessary, to reject any attempted change of the Model's default value from 70 to 40 percent.

Q. What effect would the reduction of this traffic sensitive input have on the cost estimates produced by the Modified Synthesis Model?

A. The effect of this change would reduce the switching element cost estimate for local usage nearly in half (43 percent). Conversely, it would double the cost estimate of the switch port functionality, thereby driving up prices for residence and business customers with lower usage. This proposed change appears to be a backdoor effort by AT&T/WorldCom to adjust access usage fees by using UNE local switch usage as a proxy for access local switching. The Commission should reject Ms. Pitts' proposal outright.

[53] Before the Maryland Public Service Commission, Case No. 8745, *Hearing Transcript, Volume VI* (July 5, 2001) at pgs. 1692-1703.

4. Inter-Office Facilities

Q. Does the Modified Synthesis Model produce the requisite number of inter-office trunks?

A. No. The Modified Synthesis Model uses projected year 2002 demand data and produces approximately 605,000 trunks, which are spread among its seven types of trunk groups. The number of trunks is the result of Mr. Pitkin using inappropriately projected year 2002 line and call usage data.

Q. Is AT&T/WorldCom's year 2002 projection of trunk needs valid?

A. Absolutely not. Mr. Pitkin determines year 2002 trunking needs without using appropriate forecasting methods or even considering the realities of the industry; as a result, there is no verifiable or credible support for his year 2002 count of interoffice facilities.

Q. How do Mr. Pitkin's trunk estimates for year 2000 compare to Verizon VA's trunk count?

A. Mr. Pitkin's trunk estimate for the year 2000 fell 18 percent short of Verizon VA's trunk count. The Modified Synthesis Model, as I discussed, ignores standard engineering principles and considerations when designing the trunk network, and, as a result, produces too few trunks.

Q. What else accounts for this understatement of trunks?

A. The Model also fails to account for trunk modularity in which current digital technology makes it more efficient to install transport in groups of 24 trunks rather than on an individual basis as suggested by the Model. Ms. Pitts concurred with this modular concept during a recent USF proceeding in Maryland.[54]

Q. How does trunk modularity cause an understatement of trunks?

A. The Modified Synthesis Model builds a trunk network based on the assumption that there are only seven types of trunk groups, a number that represents approximately one-third of the trunk group types deployed in Verizon VA's network. It is this combining of trunk group types as well as the combining of trunks within each group, that contributes to the understatement of the trunk count since trunks are built on an end-office to end-office basis in groups of 24 in the real world.

The Modified Synthesis Model, in building its direct trunk plant, is unable to identify the specific end-office to end-office trunk groups that need to be built, but instead treats all direct trunks from each end-office as a single group. It is this aggregated approach that, in part, causes the Modified Synthesis Model to understate direct local trunks as well as other types of groups and IOF investment.

Q. Does the Modified Synthesis Model correctly calculate the number of access trunks that would be required in a network?

[54] Before the Public Service Commission of Maryland, Case No. 8745, *Hearing Transcript, Volume IV* (June 28, 2001) at p. 916, lines 9-11.

A. No. The Modified Synthesis Model understates the number of access trunks because it fails to recognize that demand for access trunks (trunks connecting ILEC switches to interexchange carriers ("IXCs"), CLECs, and Cellular switches) is a function of how many trunks are ordered by these carriers. It is not a function of DEMs or Call Completions as assumed by the Modified Synthesis Model. IXC, CLEC, and Cellular companies operate in an extremely competitive environment and by necessity must order the number of trunks they believe are required to meet their growth and load forecasts. I doubt that AT&T/WorldCom would be satisfied if Verizon VA supplied fewer access trunks than it requested in Virginia or any jurisdiction.

Q. Does the Modified Synthesis Model include the capitalized labor costs associated with trunk installation?

A. No. The Modified Synthesis Model fails to include the capitalized labor costs associated with trunk installation, thus ignoring the fact that the installation of switched trunk transport requires circuit design, central office translations, and testing prior to the activation of trunks. The labor cost associated with these activities is capitalized, and should be included with trunk investment in the Uniform System of Accounts' circuit equipment account. The Modified Synthesis Model does not account for these capitalized labor costs, and thus understates IOF investment.

Q. Does the Modified Synthesis Model's understatement of IOF comply with the Commission's TELRIC principles?

A. No. The Commission's TELRIC methodology requires that all demand be assumed as a given. In the First Report and Order, the Commission stated:

> We conclude that, under a TELRIC methodology, incumbent LECs' prices for interconnection and unbundled network elements shall recover the forward-looking costs directly attributable to the specified element, as well as a reasonable allocation of forward-looking common costs. Per-unit costs shall be derived from total costs ... the per-unit costs associated with a particular element must be derived by dividing the total cost associated with the element by a reasonable projection of the actual total usage of the element.[55]

By understating the number of trunks required to accommodate the demands of competing carriers, the Modified Synthesis Model violates a fundamental TELRIC principle -- that UNE prices reflect all of the forward-looking costs incurred to serve total demand. In failing to capture all of the trunk demand, AT&T/WorldCom is unable to accurately estimate both the costs of IOF and the cost of tandem switching.

Q. Are there other problems with the trunk quantities in the Modified Synthesis Model?

A. Yes. As explained more fully in Dr. Tardiff's testimony, the Modified Synthesis Model overestimates special access line counts and in-turn, SONET ring capacities.

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[55] First Report and Order at ¶ 682 (emphasis added).

5. SONET

Q. What is SONET?

A. SONET is a forward-looking format for transporting a wide range of digital telecommunications services over the public network. In addition to offering a standard signal format among different vendor systems, SONET technology reduces network transport costs, promotes self-healing networks, and supports high-speed services.[56]

Q. Does the Modified Synthesis Model accurately determine SONET add-drop multiplexer requirements?

A. No. The Modified Synthesis Model is incapable of properly engineering the correct number of Add-Drop Multiplexers ("ADMs") that are required to drop and insert terminating and originating traffic at wire centers on the SONET rings. Each OC-48 SONET ring consists of one ADM at each add-drop point along the OC-48 fiber ring. In order to correctly determine the number of SONET rings needed to transport traffic between and through central offices on the fiber path, the origination and termination point of each DS-3 traveling along the ring must be known. The Modified Synthesis Model simply does not contain or develop this very basic data, and without it, there is no way to accurately calculate the required number of SONET rings (and therefore the correct number of ADMs).[57]

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[56] Telcordia Technologies, "Telcordia Notes on the Network," Issue 4 (Oct. 2000) at Section 14.15 (Synchronous Optical Network).

[57] HAI Model Release 5.0a, Model Description at p. 61. The Modified Synthesis Model assumes an OC48 SONET ring.

Since this information is not generally present in the Modified Synthesis Model, it must resort to using a simplistic approach to develop its SONET ring configurations. For example, the Model initially generates 19 inter-office SONET rings with a total of 117 nodes and 117 ADMs for Virginia.[58] The Model adds 452 additional ADMs to account for traffic on the ring, including transiting traffic between rings that exceed the capacity of the electronics, and for connections between rings. The Model, therefore, calculates 569 (117 plus 452) inter-office ADMs. Without knowledge of the actual office-to-office traffic requirements along the fiber rings developed in the Model, there is no way of determining whether the quantity of ADMs is anywhere near correct.

If, for example, it was assumed that all of the traffic along each ring was delivered to a single hub (such as a tandem)[59] along the ring, the demand for DS-3 equivalents in each ring would be divided by 48 (the maximum number of DS-3s in a 4-fiber BLSR OC48 ring where all traffic is hubbed). This would determine the possible maximum number of rings required to handle DS-3 demand for each set of offices on the rings.[60] The total number of requisite ADMs are then determined by multiplying the possible maximum number of rings by the number

[58] The quantity of nodes includes both central offices and tandem switches.

[59] The Model assumes all special access and all switched access traffic is routed through the tandem.

[60] The illustration used is representative of a possible high end situation. The requirement could be lower depending upon the amount of adjacent node to adjacent node traffic. This amount of traffic (which is essential to accurately design and optimize the rings), however, cannot be determined from the data available in the Modified Synthesis Model.

of nodes. In Virginia, 1,293 inter-office ADMs would be required, not 569 as the Modified Synthesis Model calculates. As a result, the Modified Synthesis Model could understate ADM investment by up to $39 million.[61]

Q. Does the Modified Synthesis Model understate SONET costs in other ways?

A. Yes. In addition to failing to determine the appropriate number of required ADMs, the Modified Synthesis Model also fails to accurately calculate ADM and certain DCS investment. For example, AT&T/WorldCom calculate approximately $14.15 per-line for ADM and DCS investment. However, the Modified Synthesis Model inappropriately applies this per-line investment on a per-wire center basis, as opposed to a per-line basis. In other words, the Model calculates just $14.15 for this investment category for each wire center rather than appropriately multiplying the number of lines in each wire center by $14.15 to derive the correct investment. This modeling error understates ADM and DCS investment by more than $94 million.[62] After Verizon brought this problem to AT&T/WorldCom's attention, AT&T/WorldCom corrected the latest version of the HAI Model. Surprisingly, however, AT&T/WorldCom failed to make this correction in the HAI Model components of the Modified Synthesis Model sponsored in this proceeding.

[61] $54,200 per OC48 ADM x 724 ADMs = $39.24 million.

[62] $14.15 per line x 6,673,747 lines = $94.43 million (less the $1,599 the Model actually calculated).

Q. Does the Modified Synthesis Model violate other SONET engineering principles?

A. Yes. SONET rings interconnect in central offices and, in some instances, a central office is an interconnection point between several rings. Thus, these rings should interface through a DCS.[63] However, the Modified Synthesis Model fails to account for these central office DCS units, thereby understating investment by approximately $651 million.[64] Again, AT&T/WorldCom attempted to correct this problem in later releases of the HAI Model but failed to do so in the model sponsored in this proceeding.

Q. What impact do the platform, engineering and input flaws have on the Modified Synthesis Model's output?

A. Each of the flaws I have identified will, to some degree, decrease the cost output associated with switching and the inter-office facility network, and in some cases, will shift costs from usage elements to the non-traffic sensitive switch port element. The proposed reduction of the traffic sensitive input in the Modified Synthesis Model reduces the switching cost per minute for local usage by approximately 43 percent. However, the cost of the switch port functionality would double, thereby driving up switch port prices for all switched subscriber lines, including those with minimal usage levels. It appears that this shift in cost is intentional. The IXC's attempt to use this fabricated low cost for local

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[63] A DCS provides the ability to remotely perform digital cross connections between SONET rings.

[64] 452 ADMs x 48 DS-3s per ADM x $30,000 per DS-3 per DCS = $650.88 million.

switching minutes to justify a lower cost of a switched access local minute. The effect of shifting the revenue requirement of the millions (or billions) of local access minutes to the line port element will negatively effect low usage subscribers of switched lines. Furthermore, the Modified Synthesis Model does not account for trunk modularity, which requires that trunks be provided in groups of 24. By assuming trunks can be provided one at a time the Model is able to understate real-world costs. The Modified Synthesis Model also fails to include the capitalized labor costs associated with the installation of trunks, thereby understating IOF investment even further. In addition, the Modified Synthesis Model understates ADM and DCS investment by approximately $750 million. Collectively, the impact is producing switch costs and costs associated with inter-office facilities that are vastly understated and that shift significant costs from IXCs to subscribers of switched lines.

Q. What would be the result if a network were built utilizing the switch functionality and the inter-office facility network designed by the Modified Synthesis Model?

A. The result would be a network incapable of handing traffic demands through its switches and an IOF network that does not have a sufficient amount of inter-office trunks and equipment to function. The Modified Synthesis Model's switch data, some of which is almost twenty years old, contain switches that are not capable of provisioning the technology for services such as ISDN and CLASS and they will not work with the SS7 signaling network. Because the Model builds

insufficient switches and inter-office facilities, customers would frequently be unable to complete calls on the network. Because the Modified Synthesis Model does not recognize that each central office and its associated trunking network has unique busy season demands, the network will result in call blockages and busy conditions for customers in exchanges with seasonal demands. Because the Modified Synthesis Model fails to provide the DCS investments required the interoffice network would not function. And since the Modified Synthesis Model does not recognize the total known demand for trunks, the network will contain only a portion of the trunks required to transport the switched calls and will have an insufficient number of access trunks to meet the demands of the Interexchange Carriers such as AT&T/WorldCom for facilities to provide service to their customers.

C. AT&T/WorldCom's Platform Modifications Are Conceptually Flawed And Result In Unrealistic And Unsupportable Cost Estimates

1. Node Selection Criteria

Q. What is the importance of node selection criteria and why is it used in the Model?

A. The node selection criteria, as explained in the Synthesis Model documentation, is the methodology used to find the least-cost solution to connect the reconstructed distribution areas to the central office.[65] For purposes of the Synthesis Model, the Commission selected a modified PRIM algorithm.

[65] AT&T/WorldCom Cost Model Documentation at Attachment B, pgs. 9-11.

Q. Is AT&T/WorldCom's modification to the Synthesis Model's node selection criteria appropriate?

A. No. Based on Mr. Riolo's recommendation, Mr. Pitkin changed the Synthesis Model's node selection criteria. This change causes the Model to use distance (PRIM algorithm) rather than average cost (modified PRIM algorithm) as the basis for connecting nodes (FDIs/SAIs) to the central office. Distance is selected as the only criteria, and other OSP input values and code changes that are relevant to node selection are consequently ignored. As a result, the ability to meaningfully evaluate the impact of other input changes, code changes, and implementation errors (such as the structure sharing adjustment) is lost.

The Commission has considered and rejected the use of a PRIM algorithm based solely on distance as the basis for selecting nodes. Instead, the Commission adopted the modified PRIM algorithm, stating "the modified PRIM algorithm provides a good approximation of the way in which real-world engineers are likely to design the feeder network, since the network grows naturally from the central office, by adding new nodes on the basis of minimum attachment cost as new communities are established."[66]

Although the Commission's comments discredit Mr. Riolo's node selection recommendation, it is also clear that the Modified Synthesis Model is

[66] AT&T/WorldCom Cost Model Documentation at Attachment B, p. 13.

flawed irrespective of which PRIM algorithm is used. Clearly, the Modified Synthesis Model fails to apply real-world engineering and economic practices when connecting nodes to the central office; if it did, the Model would produce a quantity of serving areas that more closely resemble the number actually deployed by Verizon VA.

2. Common Support Services Expense

Q. What are Common Support Services expenses?

A. Common Support Services expenses, as the name suggests, are those expenses that are common to all services. Unlike plant-specific expenses, Common Support Services expenses cannot be attributed directly to individual elements or services, but must be spread by some allocation methodology. These expenses represent a significant portion of an ILEC's total costs in providing UNEs.

Q. What is included in the Synthesis Model's definition of Common Support Services expenses?

A. The Synthesis Model defines Common Support Services expenses to include, in whole or in part, the following ARMIS accounts: Other Property, Plant and Equipment (account 6510), Corporate Operations (account 6700), Customer Operations (accounts 6610-Marketing and 6620- Services Expenses), and Plant Non-Specific Network Operations (account 6530).

Q. Has Mr. Pitkin correctly implemented his changes to the Synthesis Model regarding UNE Common Support Services expense?

A. No. In changing the definition of Common Support expense and the method of assigning this expense to UNEs, Mr. Pitkin eliminates from the Synthesis Model's calculations the cost of Marketing. For those accounts that Mr. Pitkin does include in the Modified Synthesis Model's calculations (e.g., Network Operations, Services Expenses and Corporate Operations) -- he significantly understates the expenses.

Q. Do you agree with Mr. Pitkin that Common Support Services expenses associated with marketing should be excluded in calculating TELRICs for UNEs?

A. No. Mr. Pitkin eliminates all Common Support Services expenses associated with marketing because he assumes, incorrectly, that all expenses in this account are retail-related and will be avoided when UNEs are provided.[67] By ignoring this account, Mr. Pitkin eliminates many of the costs of UNE-related activities, such as product forecasting, product management, regulatory implementation, and other activities specifically devoted to assisting the wholesale market. Mr. Pitkin fails to recognize that the cost in this account reflects Verizon VA's forward-looking cost of providing service and does not disappear if the customer happens to be a CLEC purchasing individual UNEs. Mr. Pitkin is wrong in suggesting that

[67] Pitkin Direct Testimony at pgs. 15-16.

the Common Support expenses included in the Modified Synthesis Model for USF cost calculations should be excluded when determining UNE costs. Rather than being eliminated categorically, the costs in this account should be examined to determine which costs are and are not appropriate to UNE calculations.

3. Network Operations Expense

Q. What are Network Operations expenses?

A. Network Operations expenses are the costs required to operate the telecommunications network that are common to all services. The costs include power, network administration, facilities testing, and general engineering and administration.

Q. Does Mr. Pitkin appropriately account for the Network Operations expense for UNEs?

A. No. By manipulating the Modified Synthesis Model logic and inputs, Mr. Pitkin substantially understates the Network Operations expense assigned to UNEs. Specifically, Mr. Pitkin manipulates the use of forecasted lines, expenses, and a hybrid version of the Commission's Common Support Services expense methodology. Mr. Pitkin changes produce an out-of-model estimate of the per-line or per-toll minute amount for Network Operations expense. These values serve as the inputs, which are further manipulated by two new worksheets inserted in the expense module. These worksheets are purportedly designed to reallocate the per-unit input values to individual UNEs based on each UNEs

proportion of direct costs. The combined effect of Mr. Pitkin's manipulations is a significant understatement of the Network Operations expense assigned to UNEs. Dr. Tardiff provides additional discussion on this subject.

Q. Why is Mr. Pitkin's calculation of Network Operations expense values inappropriate for determining UNE cost estimates?

A. Mr. Pitkin's calculation of Network Operations expense values is flawed and understates the UNE cost estimates produced.[68] First, Mr. Pitkin inappropriately uses a forecast of 2002 expense data, claiming that he is making the data consistent with his estimated demand data.[69] However, Mr. Pitkin offers no explanation to support this claim that the use of forecasted 2002 Network Operations expense and demand data are consistent, or appropriate for use, with the Modified Synthesis Model's expense factors, most of which are of 1998 nationwide vintage. Nor does he identify what adjustment, if any, he makes to account for the discrepancy. Mr. Pitkin's method of developing forecasted expenses suffer from the same infirmities previously identified with respect to his forecast of demand.

More significantly, Mr. Pitkin inappropriately combines his flawed forecast of demand and expense data to develop per-unit values for use in the

[68] The concerns expressed regarding network operations apply to all Common Support Services expense calculations that are used in the Model and manipulated in the two new expense module worksheets.

[69] Pitkin Direct Testimony at p. 14.

Model. Attachments D and E to AT&T/WorldCom's cost study show that Mr. Pitkin has exaggerated demand growth and distorted any relationship between demand and expense. The result is significantly understated unit values. As such, use of Mr. Pitkin's methodology is inconsistent with the Commission's TELRIC requirements.

Q. Are Mr. Pitkin's modifications to the USF Common Support Services methodology appropriate?

A. No. The Common Support Services methodology was specifically designed to meet the federal USF requirements. This methodology utilizes values derived from a regression analysis that develops expenses as a function of the percentage of switched lines, special lines and toll minutes. The values derived from the regression are used as a means of allocating Common Support Services expenses between the supported services and other services. Mr. Pitkin modified the Commission's Common Support Services methodology by using the original nationwide regression values with his forecast of nationwide switched lines, special access lines and toll usage. He then used this data to apportion his year 2002 forecast of Verizon Common Support Services expenses to switch, special access, and toll services, and then divided his Common Support Services expenses figures by his forecast of year 2002 Verizon demand for these services. I have a significant concern with Mr. Pitkin's modified methodology because of the use of special access DS-0 lines, which I previously explained in my discussion on the use of special access DS-0 line equivalents in the Modified

Synthesis Model. Using DS-0 lines in the common support methodology means that DS-3 Network Operations expenses are 672 times greater than those of a two-wire copper loop used to provide basic exchange service. Such an illogical assumption exaggerates a network's efficiencies, and thus will not produce a reliable estimate of actual Network Operations expense for any UNE.

Q. Please explain your concerns with Mr. Pitkin's manipulation of the Synthesis Model's logic to assign Network Operations expense to UNEs.

A. The use of the previously described input values introduces significant distortions regarding the data vintages used by the Model. Mr. Pitkin inserts two completely new and complex worksheets into the expense module that purportedly select the appropriate input value(s) for switched lines, special lines, and toll usage. The worksheets then assign the value to individual UNEs based on each UNEs proportion of direct costs.

The Model's use of these new worksheets effectively creates a significant modification to the expense module -- a module that, as a result, has not yet had its logic and algorithms validated. Verizon VA requested the necessary documentation in discovery, but has not yet received any information. In addition, Mr. Pitkin has not demonstrated that his new modification received any public scrutiny or has been tested by an independent third party. In effect, AT&T/WorldCom is asking the Commission and all parties in this case to trust

AT&T/WorldCom simply on the basis of its word, without any empirical evidence to support its claim.

Q. Explain the distortions that result from the use of forecasted 2002 Network Operations expenses input values in the Modified Synthesis Model.

A. Distortions are introduced into the Modified Synthesis Model as a result of mixing data from significantly different time periods and different geographic areas. For example, the Network Operations expenses are specific to Verizon VA's operations and are based on forecasts of 2002 demand and expense levels. In the Modified Synthesis Model expense module, these expenses are applied to the direct costs calculated by the Model, the preponderance of which use 1998 nationwide expense factors and either 1997 nationwide average prices for OSP facilities or 1999 nationwide average prices for digital switching and transmission facilities. The net effect is a significant understatement of Network Operations expenses and a distortion in the amount of Network Operations expenses assigned to each UNE.

Q. Is Mr. Pitkin's assignment of Network Operations expenses appropriate?

A. No. The input values for each service are based on the values developed for the federal USF mechanism, adjusted to reflect nationwide demand relationships and then assigned to elements in the Modified Synthesis Model based on direct costs developed from a forecast of Verizon VA's demand. To assume that these USF-based per-unit input values can be extensively manipulated and then assigned to

individual UNEs is absurd. Any in-depth analysis, however, is significantly constrained by the absence of documentation.

Q. Has Mr. Pitkin failed to properly account for any other expenses in his UNE cost calculations?

A. Yes. Mr. Pitkin also fails to include the cost of local number portability. Mr. Pitkin assumes, incorrectly, that a CLEC's ability to purchase individual or bundled elements means that the ILEC will no longer incur these costs. This is simply not true. Additionally, Mr. Pitkin, in determining services expenses, uses a HAI Model derived surrogate value of $1.69 per-line per-year for customer service expenses in account 6623. The HAI Model documentation shows this value is based on 1996 nationwide expense and line data reflecting the cost to provide IXC access service.[70] The use of this historic nationwide expense and demand data is not based on Verizon's current cost to serve the CLEC market in Virginia and is inconsistent with the TELRIC standard that unit costs be forward-looking and based on the ILEC's provisioning of other elements.

Q. Has Mr. Pitkin used an appropriate methodology for developing forward-looking Corporate Operations expenses?

A. No. Mr. Pitkin's use of an 8 percent factor for Corporate Operations expenses is conceptually flawed and inconsistent with the assignment of other Common Support Services expenses, as well as with the Synthesis Model's logic, which

[70] HAI Model, Release 5.0a, HIPS, at Appendix C, p. 157.

includes these expenses as a dollar amount per unit of demand. Mr. Pitkin offers little support for his 8 percent factor,[71] but my most significant concern is that Mr. Pitkin's factor is being applied to a base of expenses that is inconsistent with the base from which it was developed. This approach has the effect of overstating efficiencies for these Corporate Operations expenses that have already been accounted for in the cost base to which the factor is being applied. Mr. Pitkin's 8 percent factor is based on booked costs, but is being applied to a base of costs already adjusted for forward-looking assumptions. This understates the resources required to support the facilities and services, including UNEs provisioned by Verizon VA. Even the flawed methodology employed by Mr. Pitkin for Network Operations expense, is a more appropriate approach than Mr. Pitkin's use of the 8 percent factory.[72] Dr. Tardiff addresses the impact of Mr. Pitkin's flawed approach.

Q. What impact do the Model platform flaws you discussed in this section have on the Model output?

A. Each of the platform flaws I have identified will, to some degree, result in unrealistic, unsupportable and understated cost estimates. Collectively, the impact is significant. The use of the Modified Synthesis Model's code and input

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[71] AT&T/WorldCom Cost Model Documentation at Attachment A.

[72] Mr. Pitkin describes an alternative approach for assigning Corporate Operations expense using the methodology employed for the Network Operations expense component of Common Support Services. While this alternative approach is applied incorrectly, it is nevertheless an improvement on his methodology for Corporate Operations Expenses. Pitkin Direct Testimony at p. 17.

changes causes the Model to apply unrealistic engineering, service quality and economic assumptions, thus producing an insufficient number of serving areas required to serve Verizon VA's customers. The unrealistic assumptions in-turn cause the Model to underestimate forward looking costs. The Modified Synthesis Model eliminates the cost of Marketing from its calculations. By ignoring the Marketing expenses, the Modified Synthesis Model eliminates many of the costs of UNE-related activities such as product forecasting, product management, regulatory implementation and others specifically devoted to the wholesale market. The Modified Synthesis Model also significantly understates the expenses associated with Network Operations, Services Expenses and Corporate Expenses which collectively, understate the costs of providing UNEs.

IV. THE MODIFIED SYNTHESIS MODEL'S INPUT VALUES ARE FUNDAMENTALLY FLAWED (JDPL ISSUES II-1 TO 11-1-C; II-2 TO II-2-C)

A. The Underlying Default Inputs Used In The Modified Synthesis Model Are Inappropriate

Q. Are the Synthesis Model's default inputs adopted by the Commission in the Tenth Report and Order appropriate for calculating Verizon VA's cost of providing UNEs?

A. No. The Commission's Tenth Report and Order cautioned against using the inputs that were adopted for the federal USF proceeding to develop individual state UNE costs.[73] In the Order, the Commission stated repeatedly that its

[73] Tenth Report and Order at ¶¶ 30, 31, 32, 92, 238.